FNAL Remote Data Access Center

A. V. Tollestrup

Proposal:

Create a center for remote access to the LHC machine data and the CMS Detector and ATLAS if they desire to join.

Advantages for the detector people:

1. Having close contact with accelerator experts during the commissioning and initial running of the machine and detector. This type of connection has been very useful at the Tevatron.
2. Makes a center for running remote shifts.
3. Has good facilities for remote maintenance of the hardware

Advantages for the accelerator physicists:

1.CMS is already involved in commissioning parts of the hadron calorimetry and have experience with this type of operation. Experience helps!

2.I assume there will be some long term AD personnel at CERN plus others that will be there for perhaps 6 weeks. A remote center offers:
   a. Possibility of training before going to CERN.
   b. Permits participating in experiments in real time.
   c. Allows continued participation after returning home
   D Long term participation in the beam physics.

Advantage for the lab:

Makes a visible statement that we are involved in the physics at LHC. This is good for the students, postdocs, Fermilab, and the public.

Some Comments:

1. This is more natural for the detectors than for the accelerator. The detectors can almost set up their own rules for interaction with the hardware. This is a much more delicate question for the machine. Having to interact with a remote machine during commissioning and beam physics studies is exploring new territory.

2. It has to be done right. It has to have the feel of a “center” that people want to use. A community of common interest. It can’t be a “fish bowl”. This is the challenge for this committee.

3. This has been discussed with Lyn Evans, Steve Peggs, and the CMS spokespersons. More work on implementing the idea must be done. CERN will not push it…they have their hands full. It will take close collaboration with their controls people. This could be a great way to transfer some of the knowledge we have to them.

4. A few examples follow in which I have play a part as a “remote user”.

Examples:

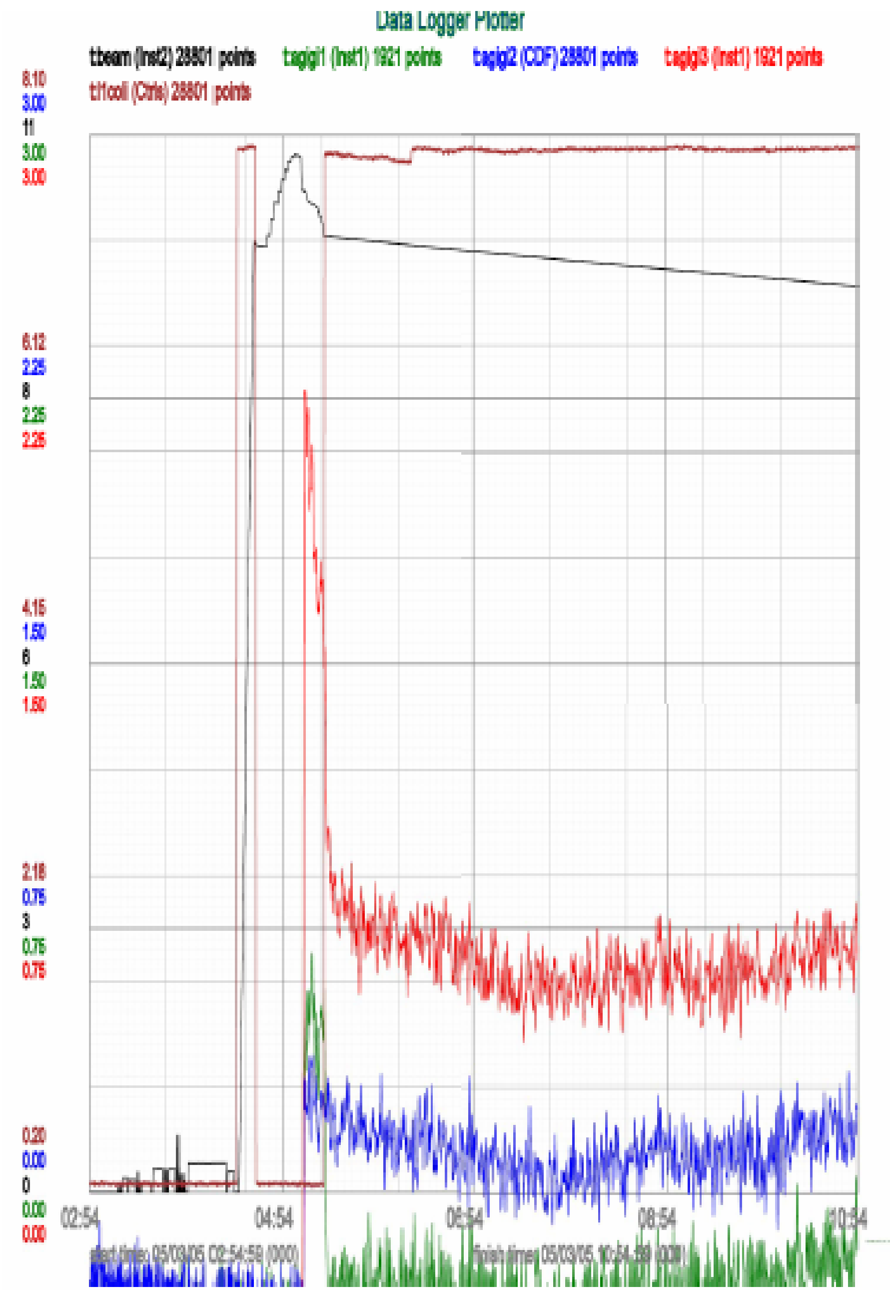
A Schottky Pickup:

Initial commissioning at CERN. But then Ralph comes home and it starts to show curious things. A good remote connection allows him to pin point the trouble or verify that things are working properly and there is something going on with the beam.

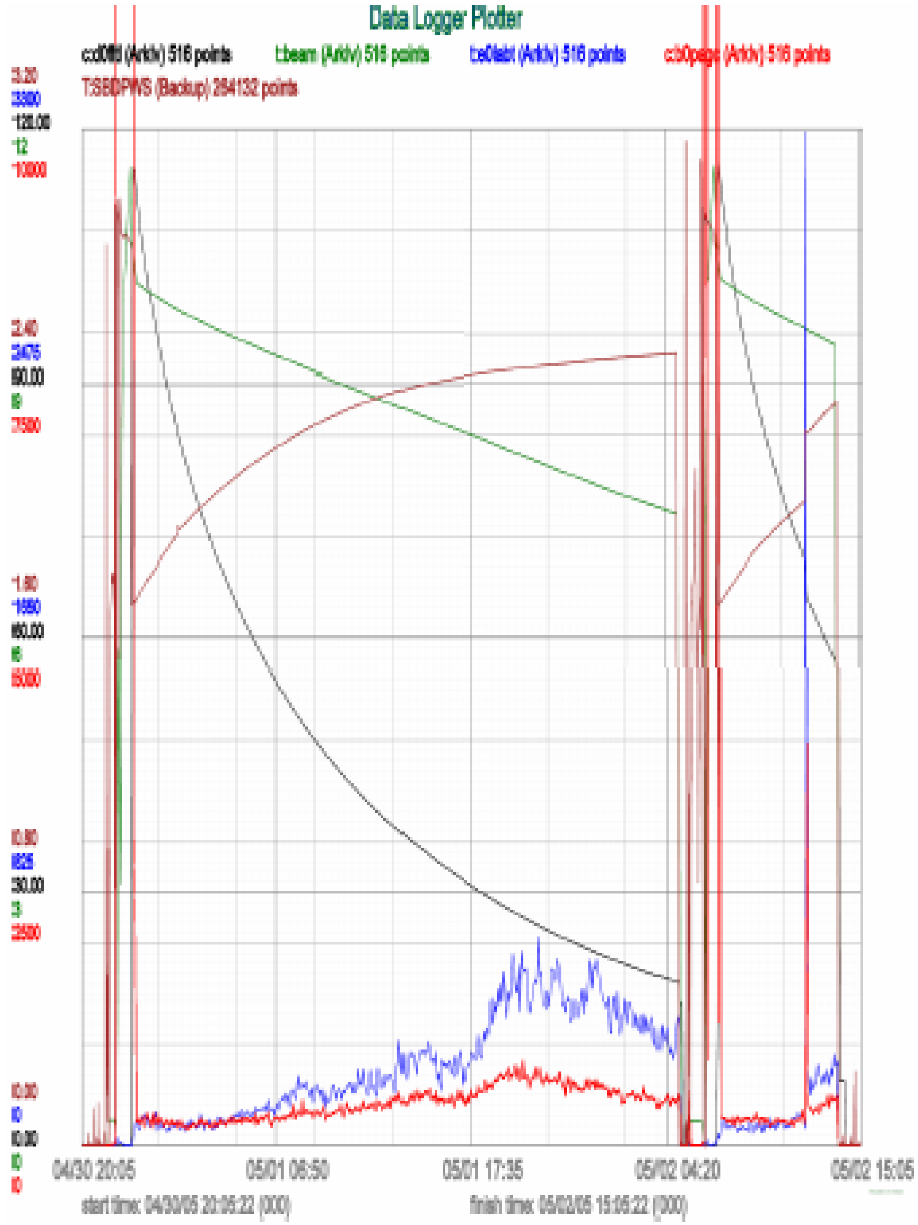
But then there is the long term beam physics investigation. This is where a remote connection would allow someone here to be closely involved in the physics.

Magnet testing:

The quads will start to be tested later this year. Remote access to this testing program would be very desirable. It would keep people that have built the magnets involved in their commissioning.

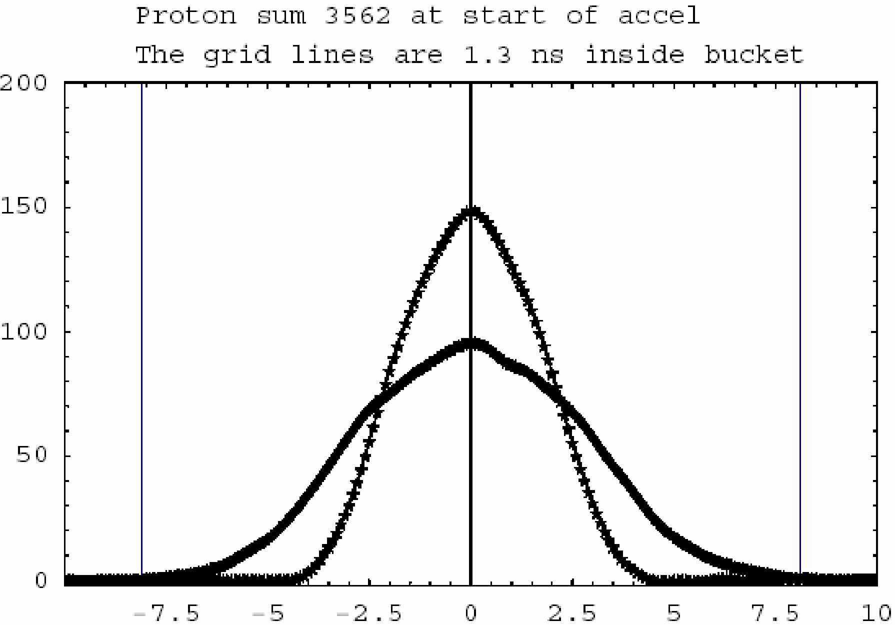


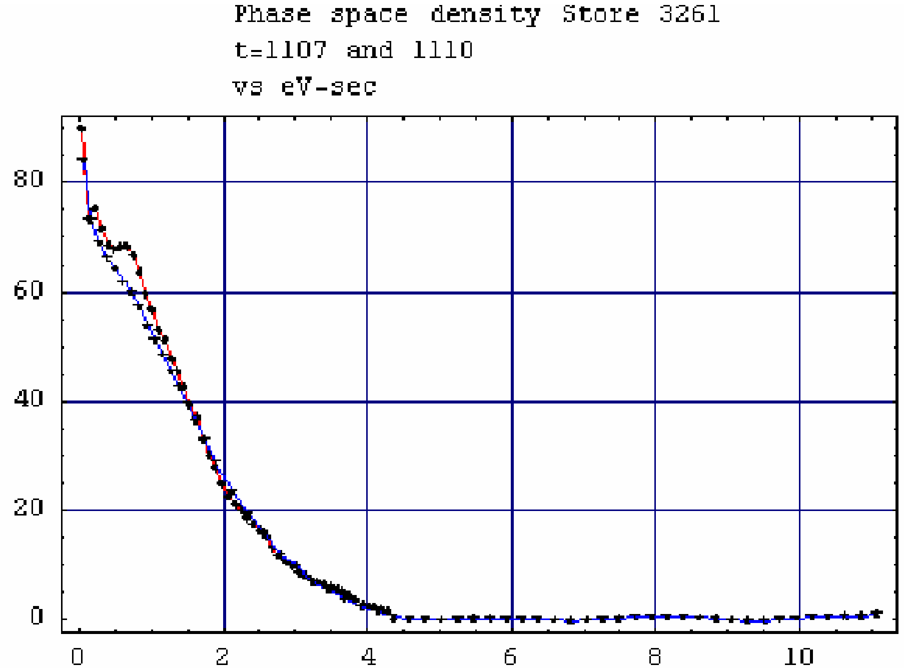
This shows the early part of a store. There is a device that monitors the synchrotron light emitted by the particle bunches. This can be gated in time. Protons in the abort gaps can cause trouble for the detectors. When the abort magnets are energized, if there are protons in the abort gap, the increasing magnet field will sweep the protons onto orbits the strike the detectors. Where to the protons come from? Are lost from the bunches during the store or are they injected at 150 and accelerated? The plot at left shows the synchrotron light turning on just after the machine reaches 980 GeV/c. The TEL then cleans out the space when it is turned on.

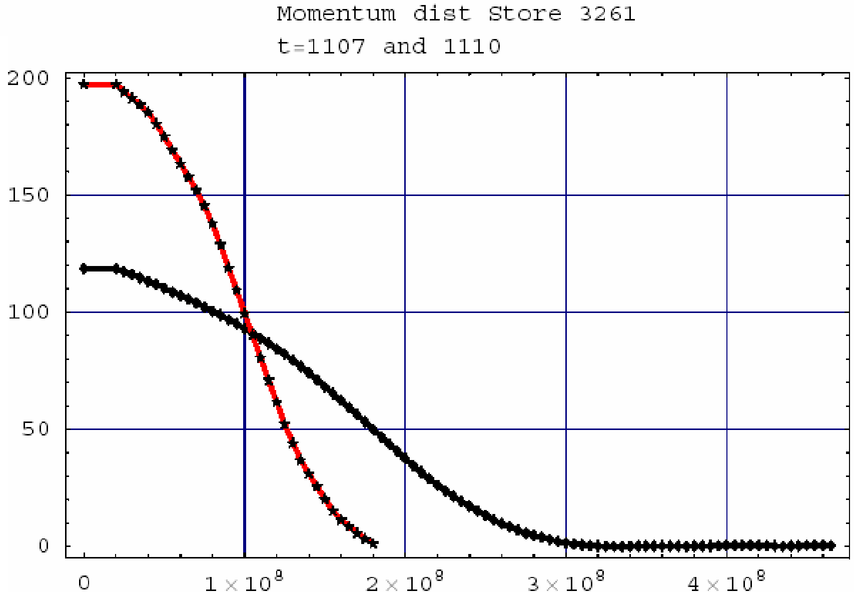


The time history of two stores is shown. The green curve is the total number of protons in the machine. The orange curve shows the bunch width growing and the bottom two curves show counters that monitor the abort gaps losses. As the bunch lengthens, protons diffuse out of the bucket and slowly spiral inward due to 10 eV/turn loss due to synchrotron radiation. These protons are swept out by the TEL in order to protect the detectors.

The curve at the end is a second store where something blew up the beam causing large losses.



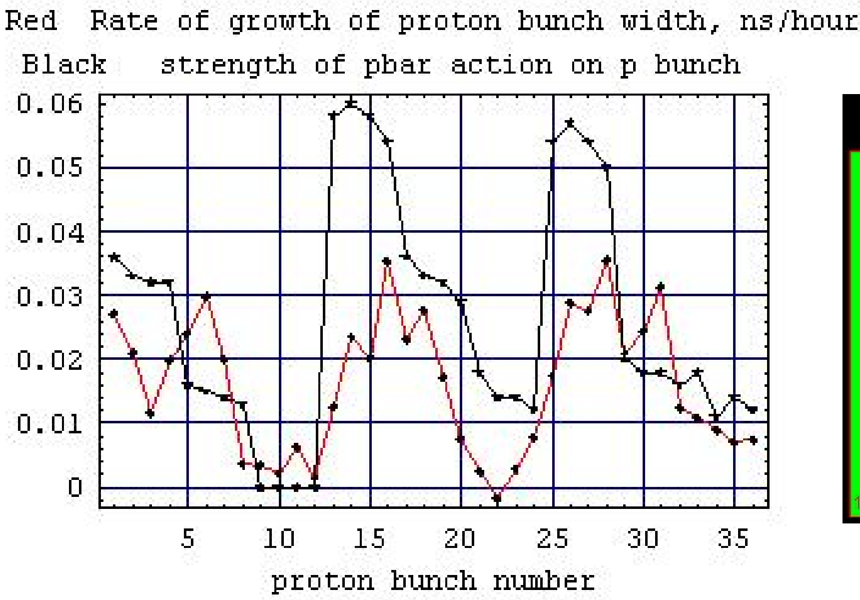


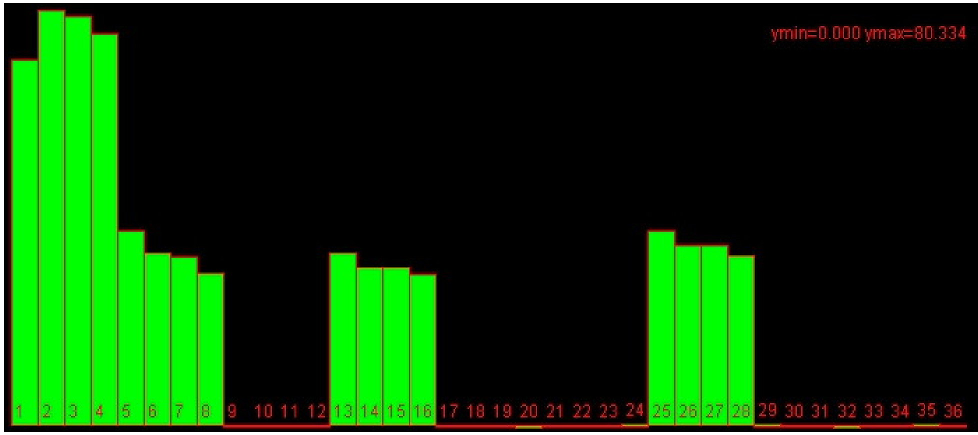


Upper Left. Proton bunch current at 150, 980 GeV/c

Upper Right. Phase space density before and after acceleration. Liouville Wins!

Left. Corresponding momentum distribution in the bunches at 150 and 980 GeV/c





This was a 36 proton x 24 pbar store. The distribution of the 24 pbar bunches and their intensity is shown to the left. The intensity of the proton bunches is nearly constant. The 24 pb bunches collide with different proton bunches at CDF and D0. We would expect the effect on a proton bunch to be proportional to the sum of the pbar intensity that it sees at B0 and D0. This is clearly seen in the loss rate which is proportional to bunch-bunch luminosity. However, the beam-beam interaction at the crossings can effect the diffusion of the proton bunch in time. This correlation is shown at the left. The black curve is the sum of the pbar intensity for a given bunch at the two crossings. The red curve is the rate of growth of width of the proton bunch in ns/hour.